App. No. 10/727,676
Office Action Dated September 7, 2005

**Amendments to the Claims:**

This listing of claims will replace all prior versions and listing of claims in the application.

Claims 1 and 12-14 are amended.

**Listing of Claims:**

1. (Currently Amended) A solid-state imaging device, comprising:

a plurality of pixel cells that are laid out in matrix form on a semiconductor substrate; and

a driving unit that is provided to drive the plurality of pixel cells,

wherein each of the plurality of pixel cells includes:

a photodiode that converts incident light into a signal charge and stores the signal charge;

at least one MOS transistor that is provided to read out the signal charge stored in the photodiode; and

an element isolating portion that is formed so that the photodiode and each of the at least one MOS transistor are isolated from each other, the element isolating portion being formed of a STI (Shallow Trench Isolation) that is a grooved portion of the semiconductor substrate, [[and]]

in the semiconductor substrate, a STI leakage stopper in which an impurity of a conductive type opposite to a conductive type of source/drain regions in the at least one MOS transistor is introduced is formed to enclose side walls and a bottom face of the element isolating portion forming the grooved portion, and

a pn junction comprising the photodiode is positioned so as to be separate from the STI leakage stopper formed along the side walls and the bottom face of the element isolating portion.

2. (Original) The solid-state imaging device according to claim 1,

wherein the element isolating portion is formed so as to isolate the photodiode from another photodiode contained in a pixel cell adjacent to one of the plurality of pixel cells containing the photodiode.

3. (Original) The solid-state imaging device according to claim 1,

wherein the at least one MOS transistor is a plurality of MOS transistors, and

the element isolating portion is formed so that one of the plurality of MOS transistors is isolated from another one of the plurality of MOS transistors.

4. (Original) The solid-state imaging device according to claim 1,

wherein the STI leakage stopper has a thickness of not less than 0.01 μm.

5. (Original) The solid-state imaging device according to claim 1,

wherein the STI leakage stopper has a thickness of not less than 0.02 μm.

6. (Original) The solid-state imaging device according to claim 1,

wherein the driving unit includes:

a vertical driving circuit that drives the plurality of pixel cells along a row direction; and

a horizontal driving circuit that drives the plurality of pixel cells along a column direction.

7. (Original) The solid-state imaging device according to claim 1,

wherein the photodiode is an embedded photodiode in which a p+ layer, an n layer and a p layer are formed in this order starting from a surface side of the semiconductor substrate, and

the STI leakage stopper is formed so as to be linked to the p+ layer of the photodiode.

8. (Original) The solid-state imaging device according to claim 1,

wherein a MOS transistor constituting the driving unit is an NMOS transistor.

9. (Original) The solid-state imaging device according to claim 8,

wherein the NMOS transistor constituting the driving unit forms an NMOS dynamic logic circuit.

10. (Original) The solid-state imaging device according to claim 1,

wherein a design rule for microfabrication of not more than 0.25 μm is used for microfabrication of the plurality of pixel cells.

11. (Original) The solid-state imaging device according to claim 1,

wherein the STI leakage stopper has a thickness that is larger at the bottom face of the element isolating portion than at the side walls of the element isolating portion.

12. (Currently Amended) The solid-state imaging device according to claim 1,

wherein the impurity introduced in the STI leakage stopper has a peak concentration of not less than $1 \times [[E^{17}]]\underline{10^{17}}\ cm^{-3}$.

13. (Currently Amended) The solid-state imaging device according to claim 1,

wherein the impurity introduced in the STI leakage stopper has a peak concentration of not less than $5 \times [[E^{18}]]10^{18}$ $cm^{-3}$.

14. (Currently Amended) A method of manufacturing a solid-state imaging device, ~~the device being a solid-state imaging device as claimed in claim 1,~~ comprising:

a plurality of pixel cells that are laid out in matrix form on a semiconductor substrate; and

a driving unit that is provided to drive the plurality of pixel cells,

wherein each of the plurality of pixel cells includes:

a photodiode that converts incident light into a signal charge and stores the signal charge;

at least one MOS transistor that is provided to read out the signal charge stored in the photodiode; and

an element isolating portion that is formed so that the photodiode and each of the at least one MOS transistor are isolated from each other, the element isolating portion being formed of a STI (Shallow Trench Isolation) that is a grooved portion of the semiconductor substrate, and

in the semiconductor substrate, a STI leakage stopper in which an impurity of a conductive type opposite to a conductive type of source/drain regions in the at least one MOS transistor is introduced is formed to enclose side walls and a bottom face of the element isolating portion forming the grooved portion,

the method comprising the steps of:

forming a groove by grooving the semiconductor substrate so that the photodiode and each of the at least one MOS transistor are isolated from each other;

implanting ions into the groove so that the STI leakage stopper is formed to enclose side walls and a bottom face of the groove;

forming the element isolating portion formed of the STI (Shallow Trench Isolation) in the groove;

forming the photodiode on the semiconductor substrate after the step of forming the element isolating portion; and

forming the at least one MOS transistor on the semiconductor substrate such that each of the at least one MOS transistor is isolated from the photodiode by the element isolating portion.